Installation Guide

Wireless Magnetic Vehicle Detection System: ClairGeo-M

Version: 1.0

TraffiClair Technology Co., Ltd.

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1. Product Introduction

1.1 System Components

The system mainly consists of a geomagnetic vehicle detector, a repeater (hereinafter referred to as RP), a receiver (hereinafter referred to as AP), and a data processing center (hereinafter referred to as DPC). The system's functionality is illustrated in Figure 1-1.

1. Geomagnetic Vehicle Detector: Utilizes high-sensitivity sensors to detect vehicle information.
2. Repeater (RP): Responsible for increasing transmission distance and altering transmission direction.
3. Receiver (AP): Responsible for receiving data from geomagnetic detectors and managing them uniformly.
4. Data Processing Center (DPC): Installed in the signal controller box, this component processes and converts received data, transmitting it to signal systems, data platforms, etc.



Figure 1-1: System Overview Diagram

1.2 Main functions

- Provides data basis for traffic management departments and decision-makers.
- Detects traffic flow information such as flow volume, vehicle speed, occupancy rate, queue length, headway, etc.
- Links with intersection data to publish real-time traffic information.
- Offers various solutions including induction control, section detection, variable lane control, etc.
- Converts data resources into data service sources for operators (such as providing dynamic navigation).

1.3 System Features

- Wireless communication, stable and reliable.
- Anti-interference design, suitable for various usage scenarios.
- Anti-pressure design, effectively prevents vehicle rolling.
- Easy installation without the need for laying pipelines, minimizing road occupation time.
- High detection accuracy, with a precision rate of 99%.
- Unaffected by natural environments and weather conditions (wind, rain, snow, fog, haze, night).
- Compatible with multiple interfaces, facilitating data sharing.
- Equipped with a "Traffic Data Management Platform" for efficient device management and real-time data visibility.

2. System Installation Guide

2.1 Installation of geomagnetic sensors

2.1.1 Device appearance: As shown in Figure 2-1



Figure 2-1: Sensor appearance.

2.1.2. Size: 94mm × 65mm

2.1.3. Installation Position: 10 meters behind the stop line (depending on signal controller algorithm), in the middle of the lane.

2.1.4. Installation Process: The detector is an underground device. In the designated position, drill

a hole approximately 90mm deep and 108mm in diameter using a water drill. Refer to Figure 2-2.

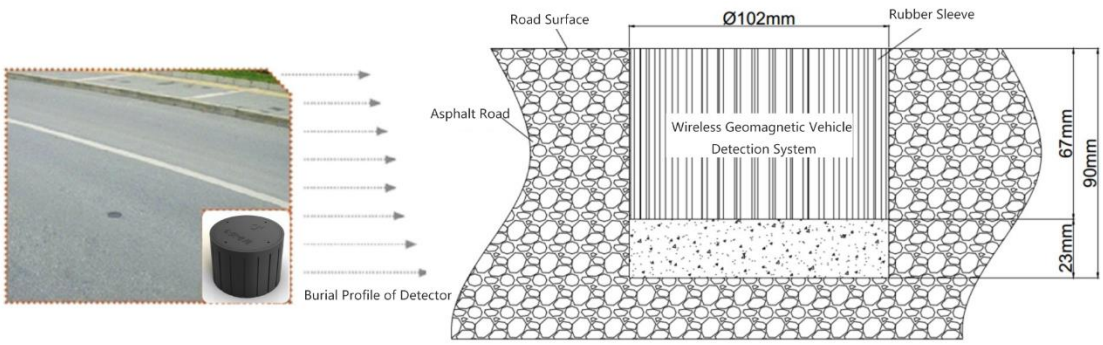


Figure 2-2: Cross-sectional View of Detector Installation

2.1.5. Installation Requirements:
- The top arrow of the detector should point towards the direction of vehicle travel.
- Mark the detector ID number and record it at the corresponding position on the lane drawing.
- Behind the installed detector position (the detector is in the front, and its opposite direction is the back), there must be fixtures (monitoring fixtures, street light fixtures, signal light fixtures) to prepare for the installation of repeaters in the future.

2.2 Installation of the Repeater

2.2.1 Device appearance: As shown in Figure 2-3.



Figure 2-3: Repeater appearance.

2.2.2. Size: 108mm × 108mm × 63mm
2.2.3. Installation Height: Above 4 meters (depending on site conditions)

2.2.4. Installation Process:
- The repeater's coverage angle is ±60° from its center, ensuring coverage of both the receiver and detector within this angle.
- The installation position should be behind the detector installation position (with the detector-to-stop line direction considered as the front, and its opposite direction as the back).
- There should be no obstructions between the repeater and the receiver.
- The installation effect is depicted in Figure 2-4.

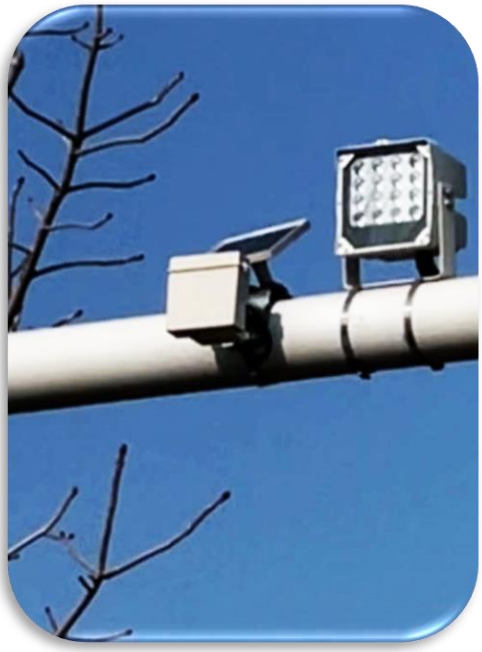


Figure 2-4: Installation Effect Diagram

2.2.5. Installation Requirements: The repeater needs to record its installation position and ID number.

2.3 Installation of Receiver

2.3.1 Device appearance: As shown in Figure 2-5.



Figure 2-5: Receiver appearance

2.3.2. Size: 160mm × 160mm × 45mm
2.3.3. Installation Height: Above 4 meters (depending on site conditions)
2.3.4. Installation Process:
- The receiver is a signal receiving device and needs to be connected to a power source (PoE powered). The installation position of the receiver should be near the signal controller. Choose appropriate fixtures for ease of wiring, preferably signal or video surveillance fixtures.
2.3.5. Installation Requirements:
- The length of the network cable should not exceed 80 meters, as this may affect the communication quality of the network signal.
- The installation effect is depicted in Figure 2-6.



Figure 2-6: Installation Effect Diagram

2.4 Installation of Data Processing Center

2.4.1 Device appearance: As shown in Figure 2-7.



Figure 2-7: Appearance of Data Processing Center

2.4.2. Size: 173mm × 125mm × 34mm
2.4.3. Installation Position: Inside the signal controller box
2.4.4. Installation Process: The intelligent data processor is used to process the detection data transmitted by the receiver. It undergoes certain filtering algorithms to obtain accurate vehicle detection data, which is then converted into switch/serial port/Ethernet signals required by the signal system. The overall layout of the intersection is shown in Figure 2-8.

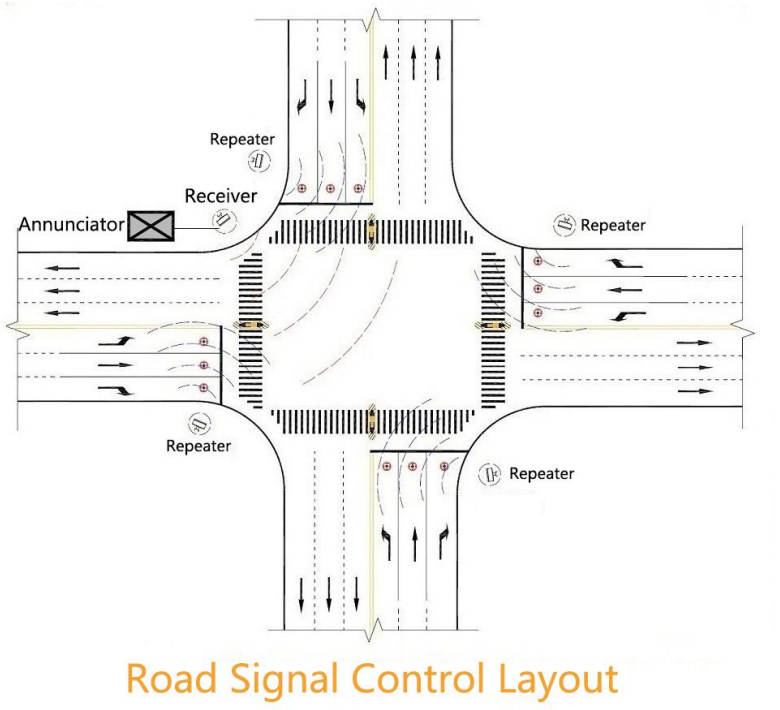


Figure 2-8: Intersection Signal Layout Diagram

3. System Debugging Guide

3.1 Equipment Connection Steps

3.1.1. Insert one end of an Ethernet cable into the network port of the receiver and the "AP" port of the intelligent data processing unit.
3.1.2. Insert the other end of another Ethernet cable into the network port of your computer and the "LAN" port of the intelligent data processing unit. The system connection is illustrated in Figure 3-1.

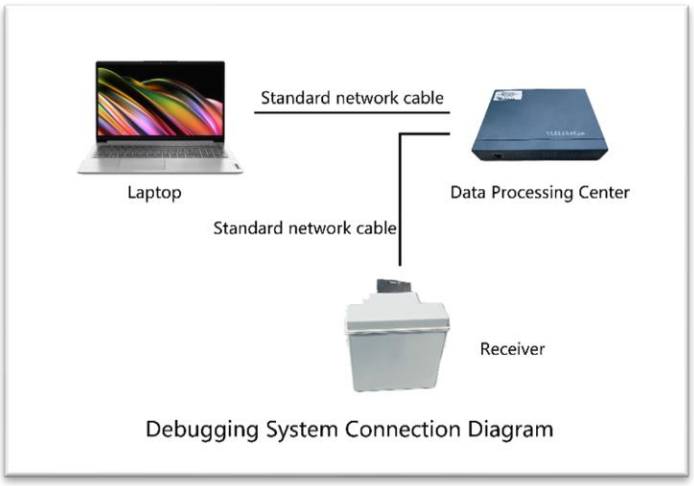


Figure 3-1: Schematic Diagram of System Debugging Connection

3.2. Connection Parameter Configuration

3.2.1. Modify your computer's IP address to 192.168.8.100 and subnet mask to 255.255.255.0.
3.2.2. Open a command prompt window and use the "ping" command to attempt to connect to the IP address of the Data Processing Center. If the connection is successful, proceed with software debugging; if not, contact technical support.
(Note: The default factory IP address for the Data Processing Center is 192.168.8.9)

3.3. Software Debugging

3.3.1. Planning: Determine which direction each repeater is responsible for connecting to the detector, record the device ID numbers, and set them to the same communication channel. Once the planning is complete, proceed with debugging.
3.3.2. Device Connection: Open the "Vehicle Wireless Detection Management System" software, enter the IP address: enter the IP address of the DPC on-site, and click "OK" to confirm. The default factory address for DPC is 192.168.8.9. The software login interface is shown in Figure 3-1.

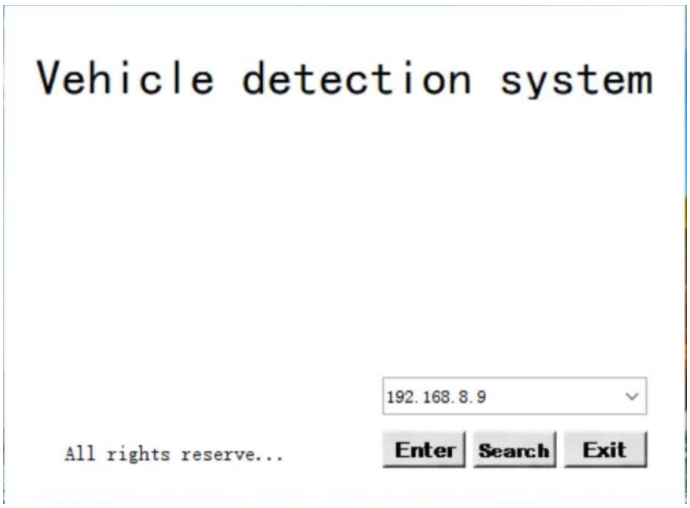


Figure 3-1: Software Login Interface

3.3.3 Main interface

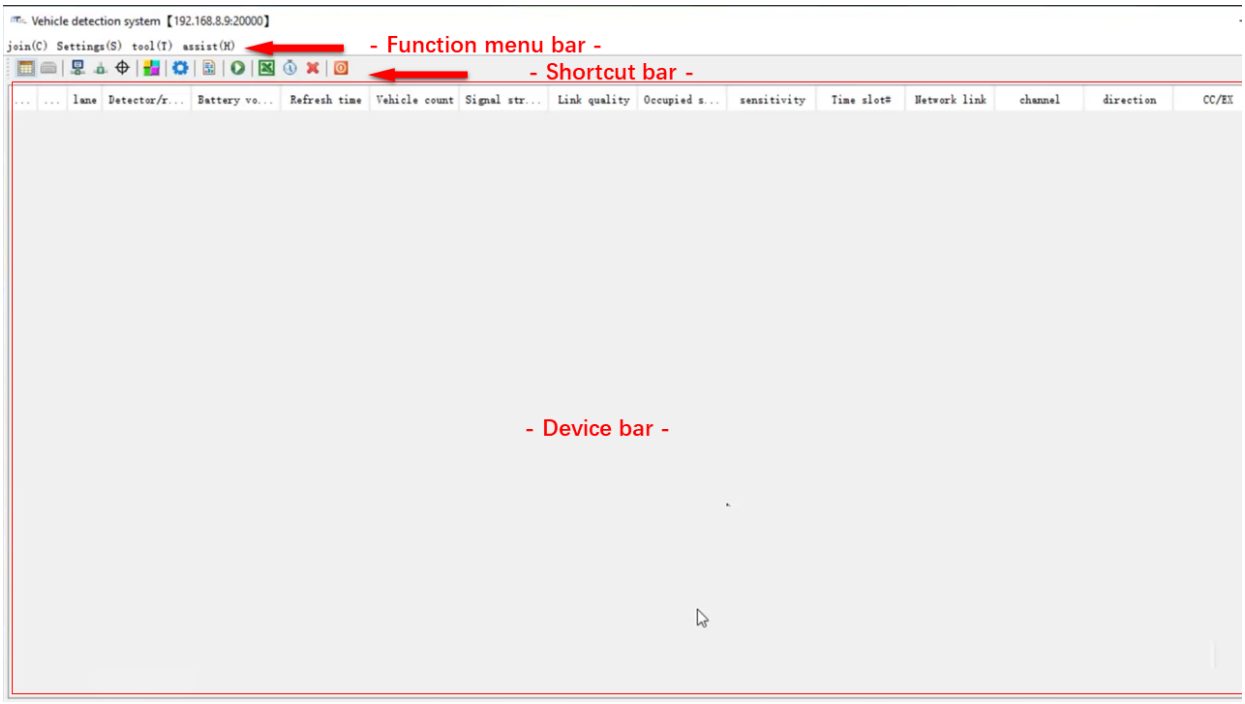


Figure 3-2: Software Main Interface

3.3.4. Debugging Steps

3.3.4.1 Refreshing the Receiver

Only when the receiver refreshes successfully can the settings for detectors and repeaters be configured. Follow these steps: "Open Settings → Receiver → Operation (top left corner) →

Refresh", as shown in Figure 3-4.

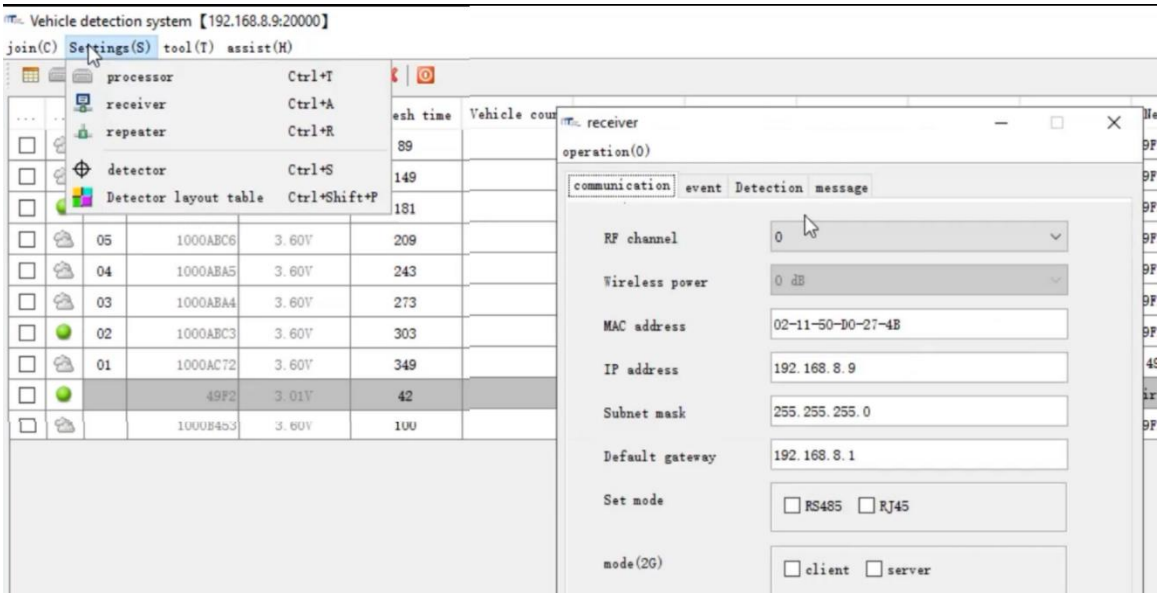


Figure 3-4: Receiver Configuration Interface

3.3.4.2 Setting up Detectors

The operation process involves: "Open Settings → Detectors → Set RF Channel to 3 → Save selected parameters", as shown in Figure 3. After setting up the detectors in this direction, configure the channel of the repeater that receives them, using the operation process: "Settings → Repeater → Set Downlink Channel to 3 → Save selected parameters", as shown in Figure 4. This way, the repeater and detector for this direction are bound together. Using this method, the devices in the other directions can also be set by changing to other channels (referred to as grouping, to prevent confusion when repeaters receive detectors from other directions at smaller intersections). Channel grouping is implemented to prevent repeaters at nearby intersections from receiving detectors from other intersections, which may cause interference. Refer to Figure 3-5 for details.

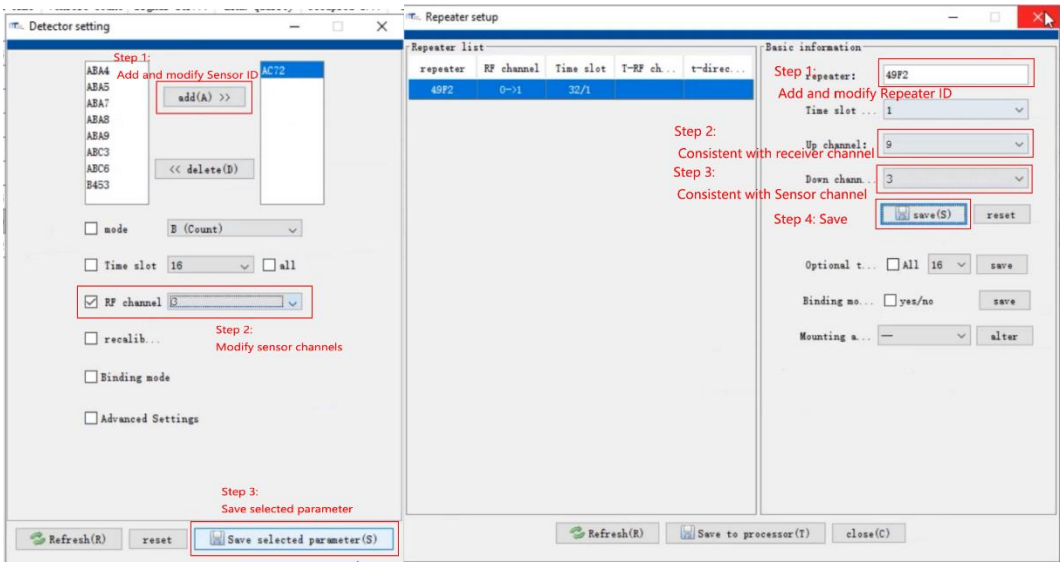


Figure 3-5: Detector Configuration Interface

Once the channel grouping is successfully set, proceed to configure the time slots for the detectors. Follow the operation process: "Settings → Detectors → Time Slot → Save selected parameters" (as shown in Figure 3-6). If you find that the changes have not been applied after saving, click "Apply" again.

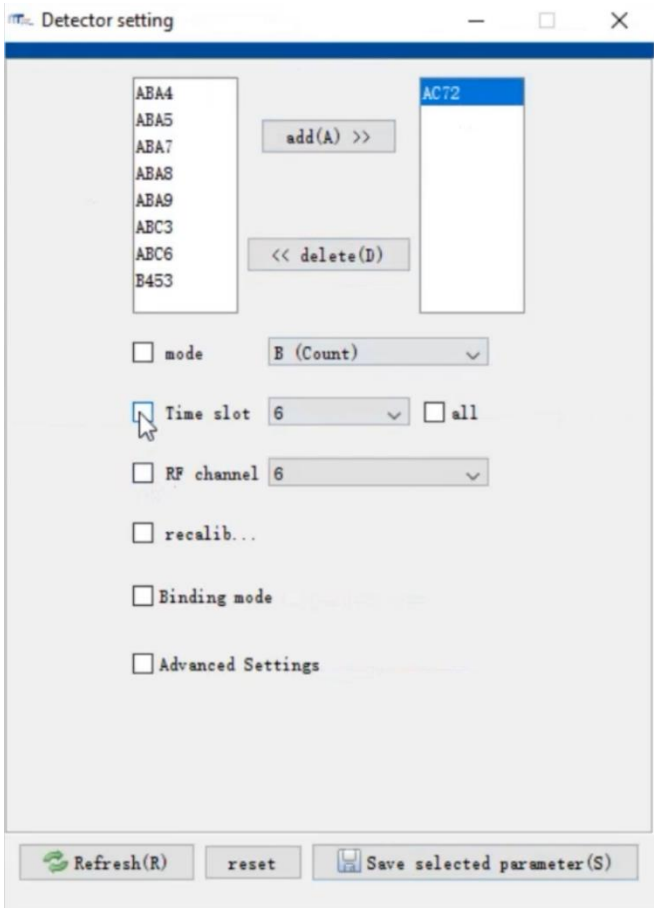


Figure 3-6: Time Slot Configuration

3.3.4.3 Setting up the Receiver

In most cases, the receiver only needs to be configured with an IP address. After configuring the receiver, it must be restarted for the changes to take effect (you can either power off the receiver or click the "  " button at the top of the main interface). Otherwise, the changes will not be applied.

3.3.4.4 Setting up the Intelligent Data Processor

1. Connect the debugging equipment and click "Login" on the "Vehicle Wireless Detection Management System". Open "Settings → Processor", and the interface will be displayed as shown in Figure 3-7:

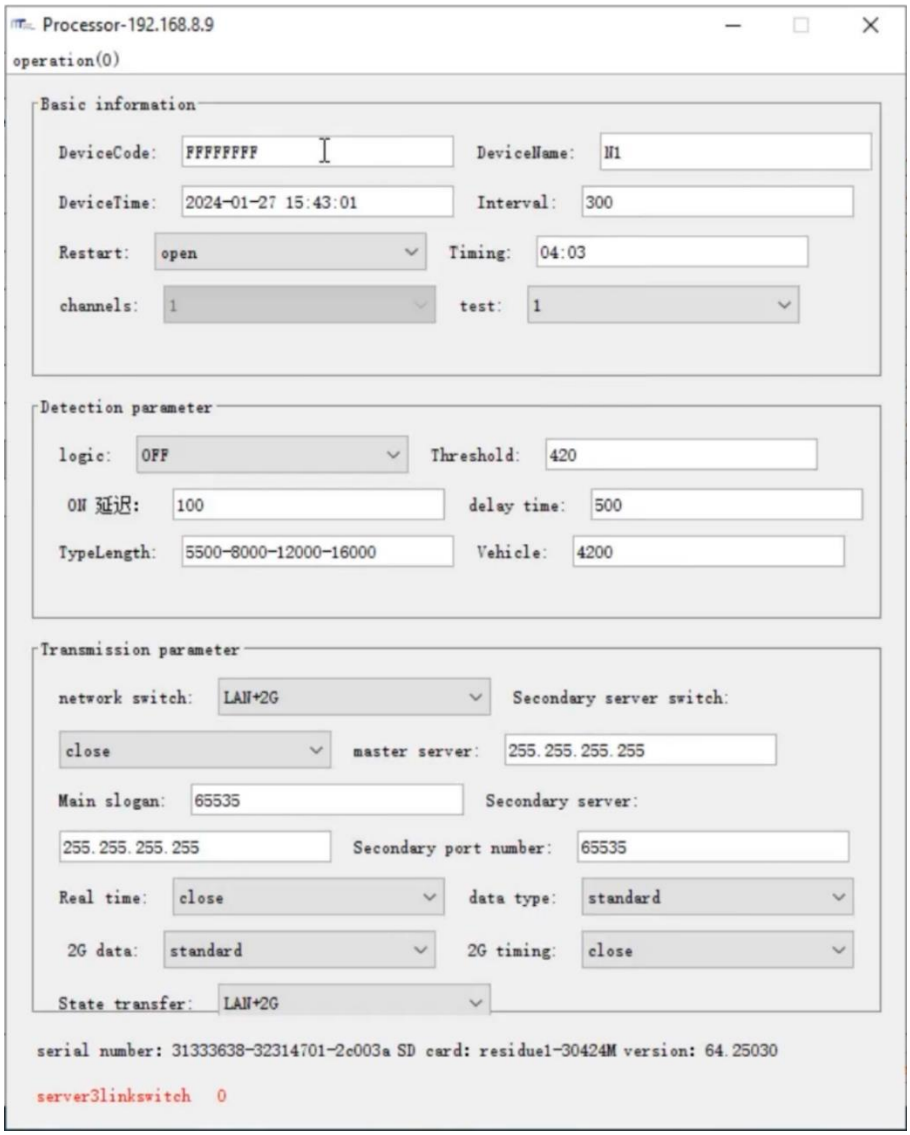


Figure 3-7: Intelligent Processor Configuration

Note: Every time DPC is restarted (while connected to AP), it will obtain IP information from AP.

2. Click the "Operation" button on the toolbar, and the interface will appear as shown in Figure 3-8. You can make corresponding configuration changes to the processor.

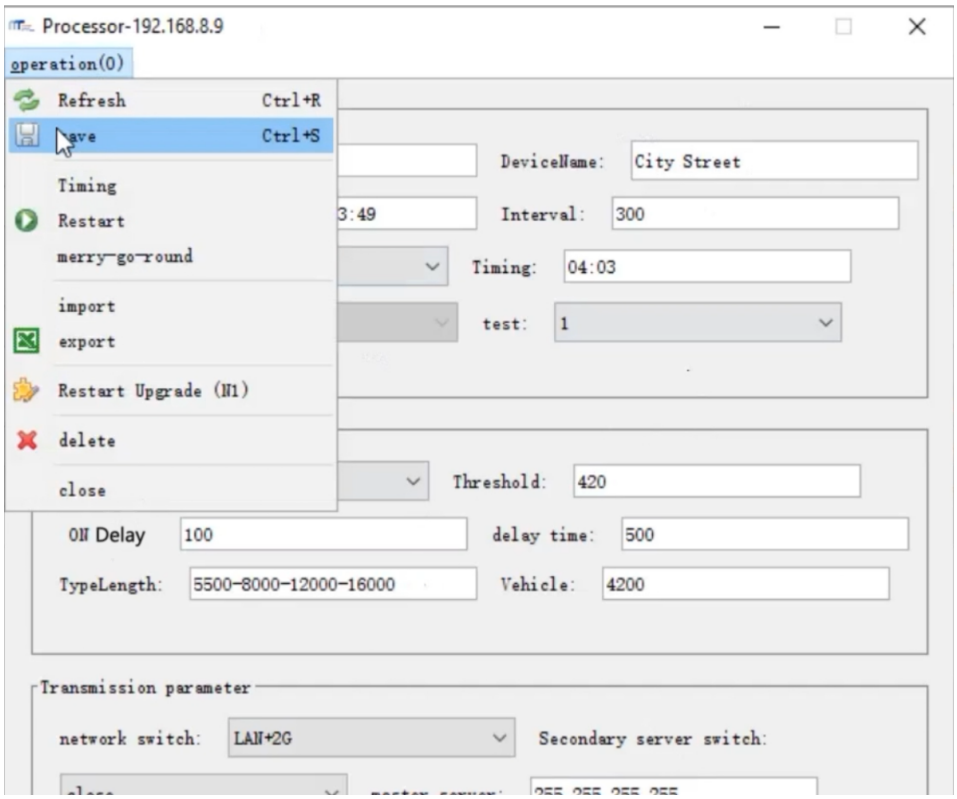


Figure 3-8: Intelligent Processor Save

3.3.4.5 Configuring Detector List

Open "Settings → Detector Deployment Table", and the interface will be displayed as shown in Figure 3-9:

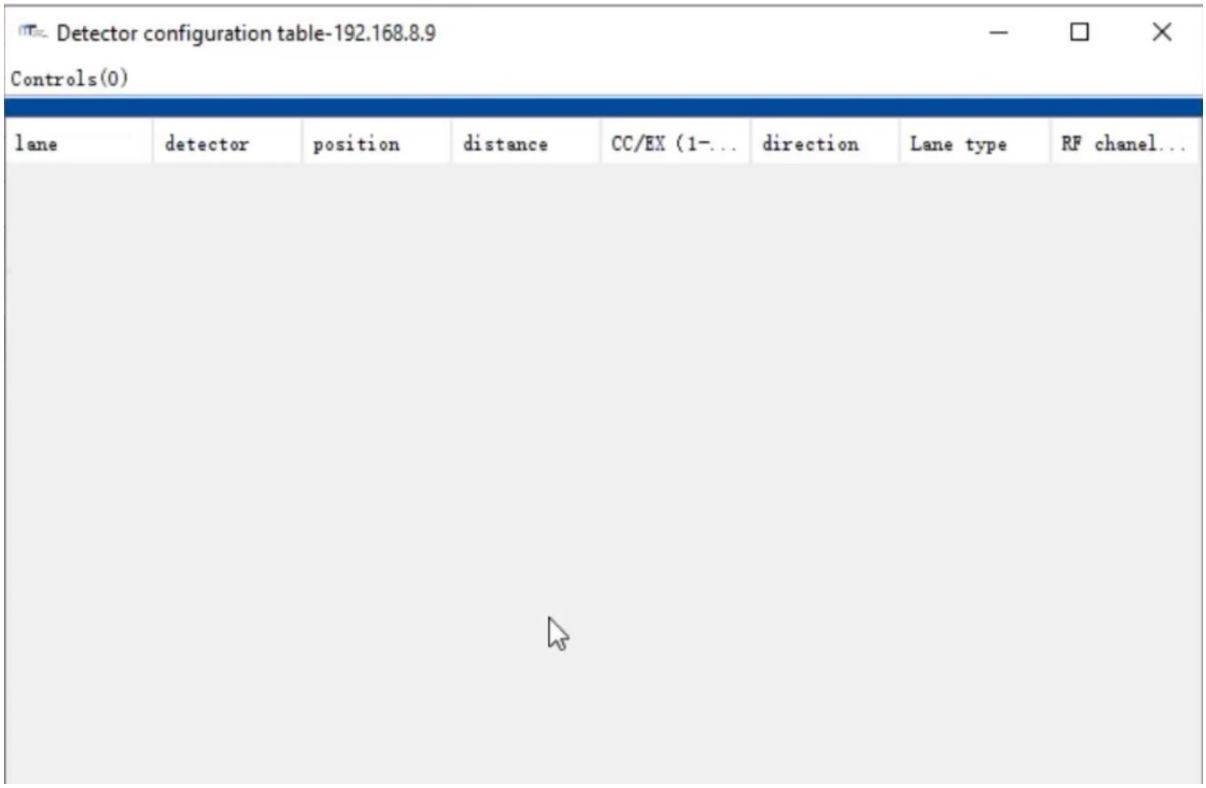


Figure 3-9: Detector Configuration Table

Double-clicking on a blank space allows you to add a row. Then, input the lane, detector ID, position, distance, and RF channel in sequence. For now, you can leave the direction and lane type fields blank. After inputting the information, select "Save" in the operation menu. This process is shown in Figure 3-10 and Figure 3-11.

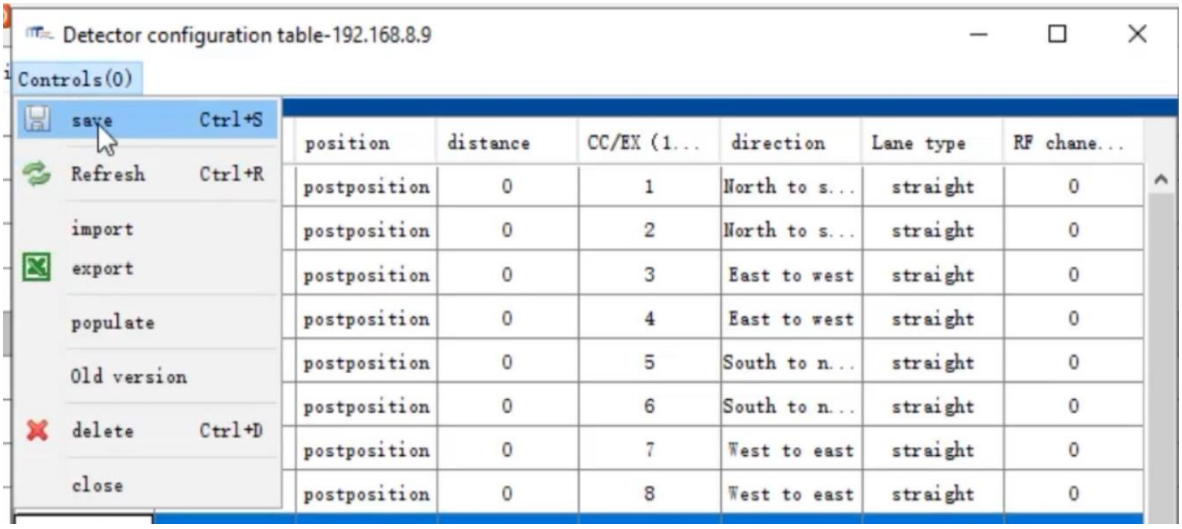
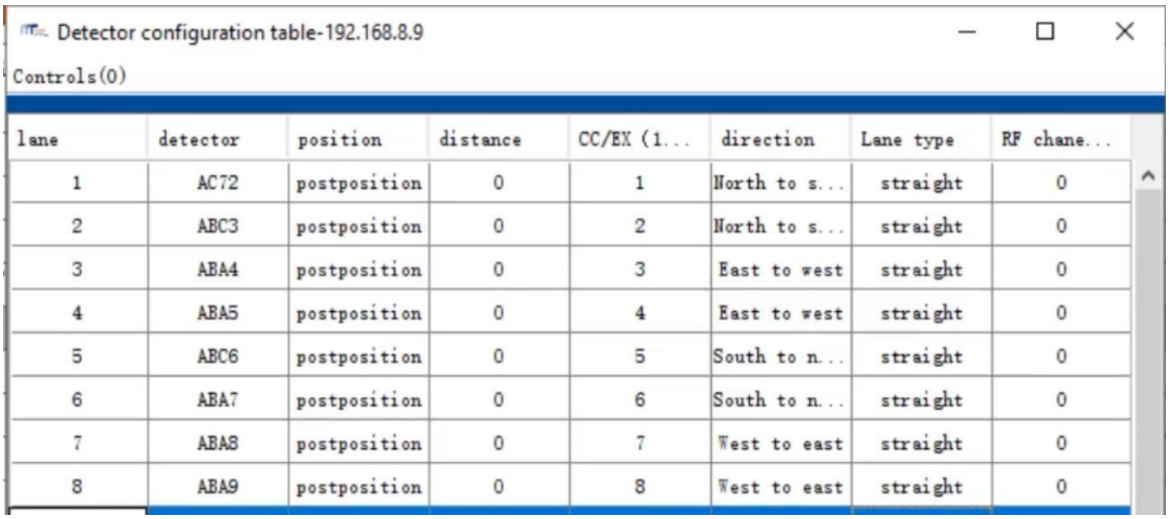


Figure 3-10: Saving Detector Configuration Table



lane	detector	position	distance	CC/EX (1...	direction	Lane type	RF chane...
1	AC72	postposition	0	1	North to s...	straight	0
2	ABC3	postposition	0	2	North to s...	straight	0
3	ABA4	postposition	0	3	East to west	straight	0
4	ABA5	postposition	0	4	East to west	straight	0
5	ABC6	postposition	0	5	South to n...	straight	0
6	ABA7	postposition	0	6	South to n...	straight	0
7	ABA8	postposition	0	7	West to east	straight	0
8	ABA9	postposition	0	8	West to east	straight	0

Figure 3-11: Successfully Saved Detector Configuration Table

3.4. Option Meanings

- Device Code: This code is a unique four-digit hexadecimal code within the entire system.
- Device Name: In DPC software versions 60.25007 and above, you can enter text information for this intersection.
- Device Time: The operating time of the device. New devices must be synchronized to ensure the accuracy of data storage.
- Counting Interval: The time interval for vehicle data statistics, both for local storage and upload to the server.
- Scheduled Reboot: Enable or disable the reboot function at scheduled times.
- Scheduled Time: The time for automatic reboot.
- Channel Quantity: This parameter is specific to MPD-DC and is used to set the number of channels connected to CE2.
- Single Point Test: Used for virtual triggering to illuminate the corresponding output indicator.
- Vehicle Separation Threshold: The time interval between two vehicles passing the detector. If it is less than this value, it is considered as one vehicle; otherwise, it is considered as two vehicles. Adjusting this value slightly based on actual conditions can affect vehicle counting. Default value is 420.
- Delay Time: Delay the ON and OFF signals received from the detector before outputting through the channel. Default value is 500.
- ON Delay Time: Extend the duration of the ON state on the output channel. Default value is 100.
- Light Logic: Determines the logic for indicating vehicle presence. "OFF" means the output channel is high when a vehicle is present and low when the vehicle leaves; "ON" is the opposite.

Default value is "OFF".
- Vehicle Length: Reserved.
- Vehicle Type Length: Length of vehicles by type, in centimeters. Default value is 2000-4000-6000-8000.
- Network Switch: Used to enable or disable data transmission on specific network platforms (off, LAN, 2G, LAN + 2G).
- Secondary Server Switch: Used to enable or disable data transmission to a secondary server.
- Main Server: IP address of the main server, e.g., 192.168.1.1.
- Main Port Number: Port number corresponding to the main server.
- Secondary Server: IP address of the secondary server, e.g., 192.168.1.2.
- Secondary Port Number: Port number corresponding to the secondary server.
- Real-time Data: Used to enable real-time vehicle data transmission (off, LAN, 2G, LAN + 2G).
- Data Type: Standard (flow, occupancy, speed), Full Data (flow, occupancy, speed, headway, spacing, vehicle length).
- 2G Data: Controls data transmission for 2G networks only.
- 2G Scheduled: Controls whether to enable scheduled transmission of 2G data.
- Status Transmission: Status transmission switch (off, LAN, 2G, LAN + 2G).
- Status (signal strength, battery voltage, packet loss rate, total received packets, status).

4. Common Issues Troubleshooting

4.1. Network Communication Abnormalities

Symptom 1: Unable to connect to the network.
- The device and PC are not in the same network segment. The default device IP address is 192.168.8.9; configure the PC's local connection to 192.168.8.X.

Symptom 2: Network communication is sometimes normal, sometimes unstable.
- If connecting to the central platform via LAN, you must set two parameters: MAC address and device code. The default values are the same and must be changed upon initial use; otherwise, network communication and data transmission errors may occur.
- Check for loose connections in Ethernet cables; redo the connections if necessary.
- Other abnormalities may arise due to product defects.

4.2. Detectors and Repeaters Not Connecting to the Network

Symptom 1: Upon initial connection, after logging into the Vehicle Wireless Detection Management System software, no devices are connecting to the network, and refreshing the receiver is unsuccessful.
- There may be an issue with the Ethernet cable connecting the receiver and the data processor.

Test this cable for any problems.
- The receiver may be faulty, or it may not be compatible with the type of receiver specified.

Symptom 2: Some devices are not connecting to the network.
- If all detectors on a particular direction are not connecting to the network, ensure that the repeater for that direction can connect to the network first. Then, verify that the recorded ID number of the repeater is correct, and ensure that the channels used by nearby devices do not conflict with the channel used by the repeater. If there are no issues, consider replacing the repeater.
- The detector may be faulty.

4.3. Failure in Detection Data Transmission

Symptom: The central server is not receiving data.
- The device code does not match the device code configured in the central system.
- Incorrect IP address or port number for the data server.
- The message center of the data server is not running.
- Database errors or failure to start.
- The detector is not configured correctly.

4.4. Failure of Passing Light Indicators

Symptom 1: The status light of the device does not light up when a vehicle passes, but it lights up when there is no vehicle.
- The logic for indicating light may be inverted. Reset the logic for indicating light.

Symptom 2: The indicator light of the device does not flash when a vehicle passes.
- If the Vehicle Wireless Detection Management System software displays normal vehicle counting and the detection list is correctly configured, then ensure that the channel wires are connected correctly according to the requirements of the signal system.

4.5. Unstable Time Slots

Symptom: When observing the detectors in the Vehicle Wireless Detection Management System software, the time slots of the connected detectors are constantly changing.
- There may be multiple receivers with the same channel within the transmission range of the detector. It is recommended to avoid using the same channel when deploying receiver devices at adjacent intersections.
- The detector may be faulty.